15¢

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • JUNE 22, 1946

Birthplace of Radioisotopes

See Page 387

A SCIENCE SERVICE PUBLICATION

1921 TWENTY-FIFTH ANNIVERSARY 1946

Launching a New Era . . .

Nearly half a century ago, George Westinghouse developed a revolutionary steam turbine that supplanted the steam engine as a driving force for central station generators.

Always vitally interested in better transportation, Westinghouse quickly realized that here was the *ideal power source* for ship propulsion. Because of its compactness, the steam turbine would permit more space for fuel . . . reduce weight and vibration . . . assure far greater fuel economy.

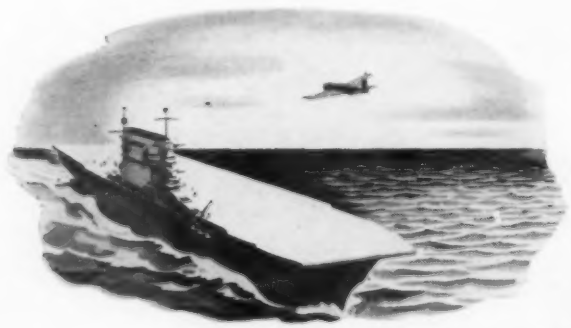
But there was one engineering problem that no one had yet solved—an efficient means for coupling the rapidly whirling turbine shaft with the ship's slow-moving propeller. George Westinghouse supplied this missing link—with the help of marine experts, Rear Admiral Melville and John H. MacAlpine—by developing the first practical *gear-reduction turbine drive.*

After six long years of study and experiment, Westinghouse built two 3250 horsepower geared turbines which were installed in the collier, U. S. S. Neptune—launched on June 21, 1912.

The trial run was a notable success. It was one of the great achievements of George Westinghouse's remarkable career—*for it initiated a new epoch in marine propulsion.*

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE



TODAY—The world's greatest warships and maritime vessels are powered by reduction-geared turbines, pioneered by George Westinghouse in 1912. Many of them are driven by Westinghouse propulsion equipment. Recently, the U. S. Aircraft carrier Lake Champlain crossed the Atlantic at the *record-breaking* average speed of *32.048 knots.* The geared turbines in the Lake Champlain—as well as in all other Essex class carriers—proudly bear the nameplate of the Westinghouse Electric Corporation

Tune in: TED MALONE—*Monday, Wednesday and Friday, 11:45 am, EDT, American Network*

PHYSICS

Radioactive "Tracers"

Radioisotopes, product of atomic energy development, to allow inquiry into disease causes, photosynthesis and life processes. About 100 isotopes are available.

See Front Cover

➤ EXPLODING CHEMICAL elements, made synthetically in chain-reacting atomic energy piles, which will work for peace instead of war, are the products of a new manufacturing enterprise announced by the War Department's Manhattan Engineer District, Oak Ridge, Tenn. (*Science,* June 14).

They are what are called the radioisotopes of the common elements. Introduced into familiar substances, these special synthetic kinds of radioactive atoms can be traced through everyday but little understood processes. They can be tracked by means of the rays they give off.

By such "tracer" studies scientists are making headway in understanding how plants build our food out of water, air and sunshine, how compounds like the sulfa drugs combat disease, how industrial chemical reactions take place, and how life processes are passed on from generation to generation.

New Venture

The new manufacturing venture, resulting from atomic bomb research, undertakes to supply to qualified research organizations the radioisotopes which come out of the Oak Ridge chain-reacting piles as fission products of uranium. Many of them were troublesome by-products of the reactions that produced material for the atomic bombs. Now the men who run the piles are looking for the best uses for them.

Since recovery of the minute amounts of many radioactive elements which occur under the conditions which make the bomb elements has not proved practical, experiments have been directed toward the production of the particular isotopes most in demand for research. These are radioactive forms of carbon, sulfur, phosphorus and iodine. All these are furthering new knowledge of life processes and promise better ways of conquering disease.

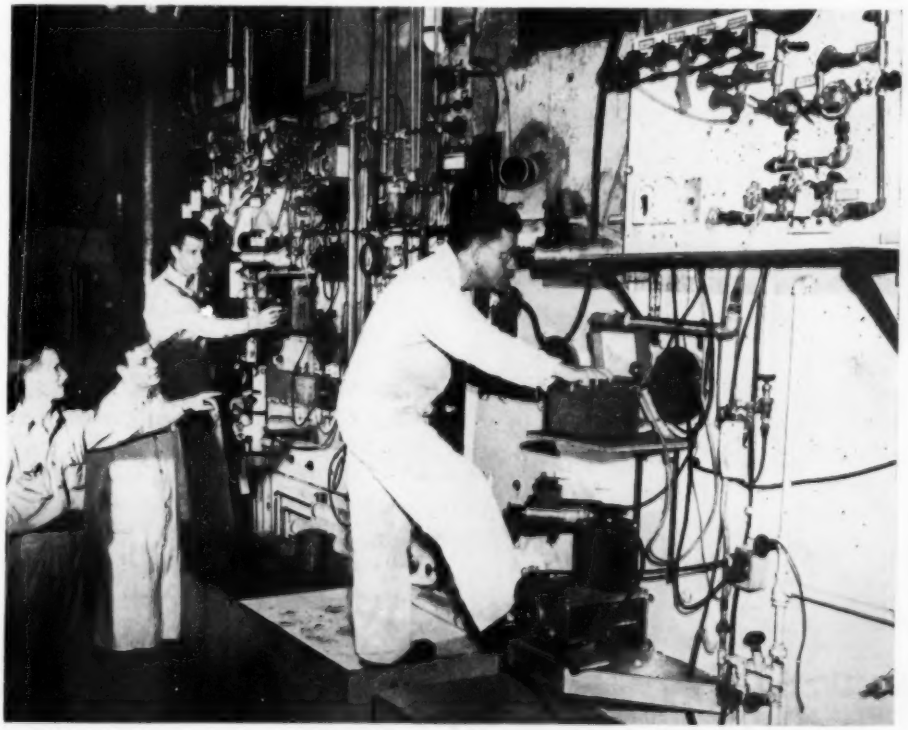
Possibilities of isotope production are, however, by no means limited to these elements. Over 400 man-made radioactive isotopes of the 96 elements are known, and the scientists at Oak Ridge are ready to begin negotiations about supplying any of them with a half-life of more than 12 hours.

Under the program announced, approximately 100 radioactive isotopes will be obtainable in varying quantities. Some of the most important of these include carbon 14, sulfur 35, phosphorus 32 and iodine 131. The numbers following the name of the element refer to the mass of the isotope, that is, to the total of protons plus neutrons in the nucleus. Ordinarily stable carbon consists of isotopes of mass 12 and 13, sulfur of 32, 33 and 34, phosphorus of 31 and iodine of 127.

Since carbon is one of the principal elements found in organic material, the isotope carbon 14 is expected to give great impetus to the study of all organic processes, including the mechanism and growth of normal and abnormal tissues and all plant and animal functions. In the medical field, at least initially, isotopes will yield their greatest benefits not directly in treatment of disease but as tools for finding the causes of diseases.

Phosphorus, which is important in plant and animal metabolism and human hemotology, is also expected to reveal many biological secrets through experimental use of its isotope—phosphorus 32. At the same time, sulfur 35 may be used in tracing reactions of sulfa drugs. Radioiodine is valuable because of its specific incorporation in thyroxin and thus can be used to study functions of the thyroid gland. These isotopes may also be useful as tracers in industrial chemistry and metallurgy.

The radioactive products have been classified in four groups: In Class A they place those whose long half-life permits stock-piling. These the laboratory will have usually on hand. Isotopes whose radioactivity decays more rapidly, so that they can be made but not stock-piled, are listed in Class B. These can be made to order. Isotopes in Class C are seldom on hand, and are produced on an experi-



Clinton Laboratory Photos.

CONTROLS OF ATOMIC PILE—Watching and controlling the "hot" operations that separate desired fission elements from the uranium pile. Two-foot thick concrete walls protect the scientists. This particular atomic pile is not making plutonium but is being used to obtain radioisotopes used in scientific experiments.

mental basis only. Those marked Class D can be made, but with difficulty.

Many months of coordinated effort among atomic scientists at various Manhattan Project facilities preceded the release of the radioisotopes for experimental work. Most of the radioisotopes will be prepared at the Clinton laboratories at Oak Ridge operated for the Army by the Monsanto Chemical Company, but the bombardment facilities of the Hanford Engineer Works at Pasco, Wash., now operated by du Pont, to be taken over by General Electric Company about Sept. 1, will also be used. Research will be conducted by the Argonne National Laboratory, which is University of Chicago operated for the Army and also at the University of California and Iowa State College.

The isotope distribution will be supervised by an advisory committee nominated by the National Academy of Sciences, with Dr. Lee A. DuBridge, new president of the California Institute of Technology now at the University of Rochester, as chairman. Dr. K. T. Bainbridge of Harvard is sub-chairman of allocation, while all requests for application of radioisotopes for human medical problems will flow through the hands of Dr. Andrew Dowdy of the Universisty of Rochester.

IODINE FROM TELLURIUM—A sample of radioactive iodine, destined for medical investigational use, is about to be extracted chemically from tellurium bombarded in the atomic pile. This activated sample has become sufficiently decayed in activity to be handled with short tongs and small shielding.

The Manhattan District's isotopes branch is headed by Dr. Paul C. Aebersold, with Dr. W. E. Cohn as chief of the radioisotope development section and Dr. J. R. Coe, director of the chemistry division.

Methods of Producing Isotopes

Several methods are available for making radioactive isotopes. The cyclotron, original apparatus for atom-smashing, and its younger sister, the betatron, are versatile in the variety of radioisotopes they can turn out, because they can utilize different atom-bombing projectiles at different energies. The chain-reacting pile works by slow neutron bombardment, and can produce isotopes by only two processes, fission and gamma ray radiation, but the yields of elements so produced are enormously greater.

The method of producing any isotope must vary with the quantity wanted and the uses to which it is to be put. For some purposes a minute quantity is sufficient. Some uses would require a high degree of purity, while for others admixture with other isotopes of the same element or with considerable quantities of different elements might not be considered undesirable. In general, the Manhattan Engineer District expects the cost of their isotopes to be cheaper if the users will take them as they come from the pile.

The photograph on the cover of this SCIENCE NEWS LETTER is the first picture of an atomic energy pile at Oak Ridge to be released by the Manhattan District. Radioactivated material is being removed from the pile at the end of a neutron bombardment period. The bombarded sample has just been lifted with the long holder from the block that has been pulled from the pile. The pile itself, which is not operating, is concealed behind the thick concrete wall. The sample's radioactive strength is being checked with a counter in feminine hands at the right.

Science News Letter, June 22, 1946

MEDICINE

Vaccine for Streptococcal Infections a Possibility

➤ FIRST STEPS toward a vaccine for protection against the hemolytic streptococci which cause dangerous sore throats and other serious illnesses were reported by Dr. Lowell A. Rantz, of Stanford University hospital, at the meeting of the American Federation for Clinical Research.

Preliminary tests show that antibodies against these germs can be produced in the blood of vaccinated persons. Whether or not this means that the vaccinated persons will be immune to attack by the germs is not yet known.

Some of the men vaccinated had severe reactions with doses of vaccine that may be too small to stimulate production of antibodies. Several became increasingly sensitive as succeeding doses were given.

These efforts to develop a vaccine against streptococci were made under the auspices of the Army's Commission on Hemolytic Streptococcal Infections when it was found that sulfa drug prophylaxis against these germs proved to have limited usefulness.

Science News Letter, June 22, 1946

SCIENCE NEWS LETTER

VOL. 49 **June 22, 1946** *No. 52*

The weekly summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N. W., Washington 6, D. C. NOrth 2255. Edited by WATSON DAVIS.

Subscriptions—$5.00 a year; two years, $8.00; 15 cents a copy. Back numbers more than six months old, if still available, 25 cents.

Entered as second class matter at the post office at Washington, D. C., under the Act of March 3, 1879. Established in mimeographed form March 18, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Readers' Guide to Periodical Literature, Abridged Guide, and the Engineering Index.

The New York Museum of Science and Industry has elected SCIENCE NEWS LETTER as its official publication to be received by its members.

Member Audit Bureau of Circulation. Advertising Representatives: Howland and Howland, Inc., 393 7th Ave., N.Y.C., PEnnsylvania 6-5566 and 360 N. Michigan Ave., Chicago, STAte 4439.

SCIENCE SERVICE

The Institution for the Popularization of Science organized 1921 as a non-profit corporation.

***Board of Trustees**—Nominated by the American Association for the Advancement of Science:* Edwin G. Conklin, American Philosophical Society; Otis W. Caldwell, Boyce Thompson Institute for Plant Research; Willard L. Valentine, Editor of Science. *Nominated by the National Academy of Sciences:* Harlow Shapley, Harvard College Observatory; Warren H. Lewis, Wistar Institute; R. A. Millikan, California Institute of Technology. *Nominated by the National Research Council:* Hugh S. Taylor, Princeton University; Ross G. Harrison, Yale University; Alexander Wetmore, Secretary, Smithsonian Institution. *Nominated by the Journalistic Profession:* A. H. Kirchhofer, Buffalo Evening News; Neil H. Swanson, Executive Editor, Sun Papers; O. W. Riegel, Washington and Lee School of Journalism. *Nominated by the E. W. Scripps Estate:* Max B. Cook, Scripps Howard Newspapers; H. L. Smithton, Executive Agent of E. W. Scripps Trust; Frank R. Ford, Evansville Press.

***Officers**—President:* Harlow Shapley. *Vice President and Chairman of Executive Committee:* Alexander Wetmore. *Treasurer:* Frank R. Ford. *Secretary:* Watson Davis.

***Staff**—Director:* Watson Davis. *Writers:* Frank Thone, Jane Stafford, Marjorie Van de Water, A. C. Monahan, Martha G. Morrow, Ronald Ross. *Science Clubs of America:* Joseph H. Kraus, Margaret E. Patterson. *Photography:* Fremont Davis. *Sales and Advertising:* Hallie Jenkins. *Production:* Dorothy Reynolds.

PUBLIC HEALTH

New World Health Plan

Improving health in every part of the world and controlling the spread of disease at its source will be aims of the UNO Health Organization.

➤ THE NEW IDEA in preventing the international spread of disease is to control it at its source. It got its first hearing at the conference on June 19 to form the UNO Health Organization.

Strengthening health services in every nation is on the program so that, for example, the health department of Nigeria could protect its own people and world travelers against yellow fever as effectively as New York City protects its millions of residents and visitors from typhoid fever.

In the past when nations took joint measures for health protection, the emphasis was on checking the importation of disease. Regulations, which became treaties between nations, were drawn up to keep diseases such as smallpox, cholera, plague and yellow fever from being imported into nations free of these health menaces.

Quarantine today is outmoded. Jet plane travellers of the future will balk at spending as much as 40 minutes in quarantine, much less the traditional 40 days or the two weeks that was customary even in fairly recent times.

Also outmoded, it seems to health authorities, is the necessity for having legislative bodies, such as the U. S. Senate, ratify vaccines against yellow fever and typhus fever. Yet that, in effect, was necessary when this and other nations signed the International Sanitary Convention for 1944 which provides for isolation of persons traveling by air who do not hold valid anti-yellow fever vaccination certificates from yellow fever regions.

Contagious diseases that might spread from one nation to another are not the only health problems that have international effects. Scientists and thousands of lay persons have learned in recent years that good health depends on good feeding as well as on germ fighting. People who are not adequately nourished are likely to be irritable and anxious or fearful. Sick minds in one part of the world can affect all the rest of us just as much as uncontrolled yellow fever in one part of the world can affect the rest of us.

Such effects cannot be kept from spreading by quarantine methods. Like germ-caused plagues, these must be controlled at the source. Strengthening of health and medical services is seen as one important method of stopping the spread of sick ideas by removing the ill health that may cause them.

To put the new medical and health knowledge into practice on a world-wide scale, UNO plans a new International Health Organization. A conference to work out the details started on June 19.

The new emphasis on improving health in every part of the world will not mean abandoning older international health activities. Collecting and disseminating information on foci of epidemic diseases, once a function of the Office Internationale d'Hygiene Publique at Paris and more recently of UNRRA, will probably be taken over by the new International Health Organization and may be the first of its activities to be started.

Sanitary Convention measures for stopping the spread of contagious diseases between nations, advisory and scientific activities of the Health Section of the League of Nations, and perhaps the cooperative international health activities of the Pan American Sanitary Bureau may all become functions of the new organization.

Science News Letter, June 22, 1946

CHEMISTRY

Chemical Kills Insect Larvae But Not Fish

➤ POSSIBILITY of killing mosquito larvae, or "wigglers" without damaging fish and frogs, a risk that is run when DDT is used, is held out as a result of experiments by Dr. E. D. Goldsmith and Prof. M. H. Harnley of New York University. Working with thiourea, a chemical widely used in industry, they discovered it to be a good insecticide, though its effectiveness differed even among varieties or strains within the same insect species.

They found, too, that thiourea will kill the larvae of insects as well as adults.

Science News Letter, June 22, 1946

METALLURGY

Germany's Progress in Use of Magnesium Alloys

➤ WHILE AMERICAN engineers were quite familiar with German progress in the use of magnesium up until the start of the European war, important wartime progress was closely guarded, but is now known as a result of American investigations on the ground.

A report by the Office of the Publication Board of the Department of Commerce includes valuable data on German magnesium alloys, their uses and methods of fabrication. American manufacturers will find them useful. Germany developed magnesium alloys, it is said, earlier than America because of a shortage of raw materials from which to obtain aluminum.

Among novel developments in the German industry was the use of anhydrous ferric chloride to refine the grain of magnesium alloys containing aluminum. This chemical, in powdered form, was packaged in moistureproof paper, with just enough in each package to treat one batch of metal. The powder was lowered into the metal in a cylindrical steel basket at the end of a long steel sweep. Workers were protected by steel shields. No accidents or explosions were reported, the American investigators state.

In addition to processes well-known in America, the Germans developed a water dip process for making ingots. This employed a hot, thin-wall mold. After removal from the mold, each ingot was sliced for fracture examination and scalped all over. German authorities claim this process produces better uniformity of composition, less waste and consistent quality. Its principal disadvantage is its higher cost.

Among other matters covered in the report, which was made by R. T. Wood, investigator for the Technical Industrial Intelligence branch of the Commerce Department, is a 30,000-ton forging press for magnesium forgings, said to be the largest and most powerful in the world. The press was equipped with eight supporting columns and stood 85 feet above the floor. Its last war job was forging aluminum wing spar caps, 20 to 35 feet long, for aircraft.

Science News Letter, June 22, 1946

In early American days, ***housewives*** dyed cloth a dark red with the liquid of the common beet, boiled until the beets lost their color.

OPTICS

New Microscope

Sharper images are possible and living cells may now be examined through new phase-difference microscope. The use of two rings makes this possible.

➤ LIVING CELLS can be spied upon without killing through use of a phase-difference microscope seized from the Germans as scientific booty of war.

Based on a Dutch idea of a decade ago, the new kind of microscope gives unusual details by use of two rings, one of which speeds up a little the light passing through it. Although the principal American microscope manufacturers had been experimenting successfully with similar devices, two instruments now in this country will help in securing production for research use in about a year.

The phase-difference microscope shows up minute differences in structure not visible before. Scientists are finding it particularly useful in the study of transparent living objects. It brings out details without preliminary staining with dyes, which kills the cells. Identifying minerals in rocks and detecting minute imperfections in gunpowder are other jobs it can do.

One of these microscopes was brought back from Germany by Gustave Guellich of the Technical and Industrial Branch, Office of the Publication Board, Department of Commerce. It is now at the National Bureau of Standards where Dr. Charles P. Saylor is studying how it is made and what it will do.

The other phase-difference microscope was secured by Col. Arthur Brice of the Chemical Warfare Service when he visited the Zeiss Optical Works at Jena, Germany, in the Russian Zone of Occupation. At the same time Col. Brice secured a motion picture, taken with the microscope, of the division of living cells of a grasshopper, giving details never before visible. Under the auspices of the Veterans' Administration, he is now showing the movie and microscope to physicians and other selected groups.

Two rings, one built in the microscope objective and the other used to control the light reaching the specimen, are responsible for the sharp, intensified image. A transparent ring is used between the specimen and the mirror reflecting the light that is to illuminate it. Here all except a ring of light is blacked out and only a hollow cone of light is focused on the specimen to be studied.

The other ring, built into the microscope lens, is inserted where the two lenses forming the objective are cemented together. Used in place of some of the cement, it consists of a ring of metal of transparent film. Light going through this ring is bent a little and speeded up, perhaps a quarter of a wavelength.

Light coming directly from certain parts of the specimen is reinforced by light from other parts that has been bent by the ring, resulting in an image of increased contrast reaching the eye. The particular parts of the object to be reinforced depend upon the refractive index of the ring film in relation to the cement used in the objective.

Before use, the position of the phase-difference ring must be adjusted so it just matches that of the other ring. The microscope, however, can be used with or without the phase-difference apparatus. Although the ring is built into the objective, it cuts down so little light when its sister ring is not in use that the image is changed but slightly.

Microscopes of this type were first described about a decade ago by the Dutch scientist F. Zernike. A number of years passed, however, before two Germans made production commercially possible.

Science News Letter, June 22, 1946

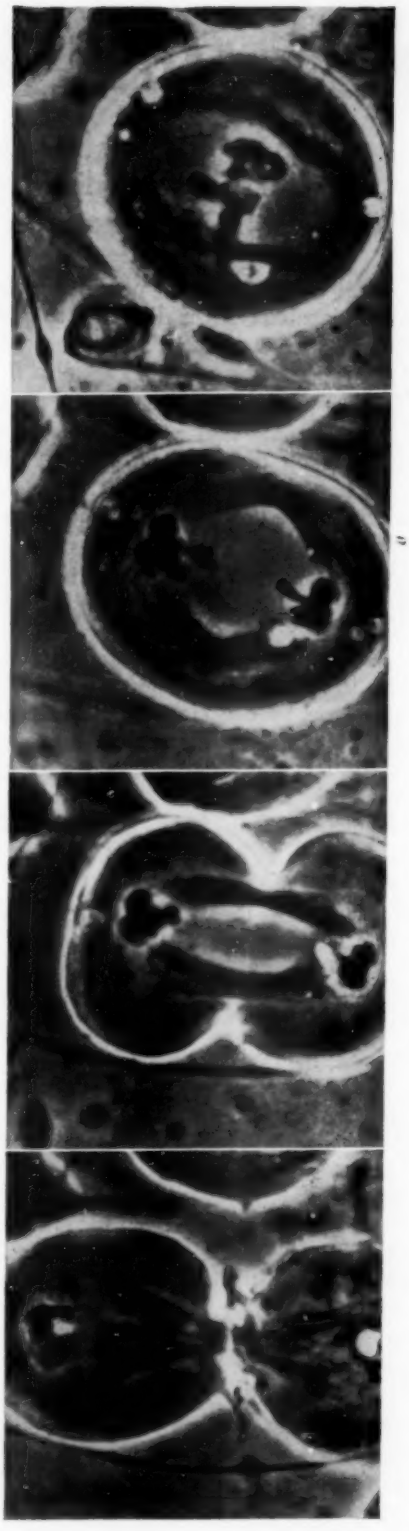
CHEMISTRY

New White Paint Developed During War

➤ INDUSTRY NOW has a new kind of glistening white finish to apply to all sorts of surfaces. It is a heat resistant paint that has properties between those of baked enamel coatings and ordinary paints.

A new silicone resin that becomes hard and durable under the influence of heat, was developed by the Dow Corning Corporation during the course of experimentation upon the unusual war-born compounds made from sand, coal, oil and brine.

Science News Letter, June 22, 1946



***CELL DIVISION**—All growth takes place by the division of cells. Cell from a grasshopper's body splitting into two parts, each of which will be a complete cell, is shown in this series. Cell division can be traced with the phase-difference microscope without having to kill the cells by staining.*

CHEMISTRY

Atomic Bomb Chemistry

Background you will need in connection with the Bikini test.

➤ STARTING with the knowledge that one kind of uranium could be split or fissioned with release of energy while another and most common sort of uranium could not, separation of the two kinds of uranium was a major task in the early stages of the atomic energy researches.

In order to make the fission reaction in uranium 235 self-sustaining, it was found necessary to separate uranium 235 (less than ½% in any uranium sample) from the more abundant isotope uranium 238 (more than 99%). The more common kind prevents the chain reaction by absorbing neutrons.

An enormous isotope separation plant, using gaseous diffusion methods, was erected at Oak Ridge, Tenn. Much of the experimental work for the whole project was done there.

Research on uranium 235 fission, using heavy water (D_2O) as the moderator, slowing down the neutrons, was under way in both England and Germany in 1939. American scientists substituted specially purified graphite for heavy water.

Two new elements, heavier than uranium 92, both of which were "made to order" and neither of which was known to exist in nature, played an important part in the atomic bomb researches and manufacture. These were elements 93 and 94.

Formation of element 94 from uranium 238 by neutron capture was effected in the Radiation Laboratory of the University of California in 1941. The new element was found to undergo slow neutron fission like uranium 235. It was named plutonium (Pu).

Plutonium, radioative but approximately as stable as radium, was obtained from uranium 238, element 92, by way of the intermediate short-lived element 93, named neptunium (Np) discovered in 1940. Uranium 238 changes to neptunium and neptunium to plutonium by beta-ray transformation.

Manufacture of plutonium from uranium 238 allowed utilization of the inert uranium isotope for atomic power purposes. It allowed the advantage of sharp chemical separation of different elements instead of the tedious diffusion methods of isotope separation.

Thus transmutation, for centuries the alchemists' goal, became the method of choice of the group of scientists who worked out the chemistry of the atomic bomb.

Here the knowledge and skill of chemists who had studied the behavior of radium and other radioactive elements were put to good advantage.

It had been found in work with such elements that their weight and their chemical nature depend on two kinds of minute particles which make up the hearts of their atoms.

The number of one kind of particle, the proton, in the atom heart is responsible for the nature of the element. One proton makes hydrogen, 26 protons make iron, 92 protons make uranium. The other kind of particle in the atom heart is the neutron. Uranium 235 has a net result of 92 protons and 143 neutrons, adding up to 235, according to the chemists' calculations, while uranium 238 has three more neutrons than its lighter isotope.

The two uraniums had to be separated, because only uranium 235 would split up the way the scientists wanted it to for use in the atomic bomb. Uranium 238 would not. By lucky chance, the very property of uranium 238 which made it useless for the purposes of the bomb provided the clue which was the best solution of the separation problem.

The more plentiful form of uranium could be made to undergo transformation into another kind of element by first adding to the nucleus of its atom a neutron, to make it so heavy that it would become unstable, then by allowing this heaviest uranium atom to shoot an electron out of its structure. This loss of electrons from the total quantity of uranium showed itself as a phenomenon familiar to scientists as the beta ray. It is the peculiar nature of radioactive elements to change into something else when they emit beta rays, and that something else is, oddly enough, not a lighter but a heavier element.

Accordingly, when uranium 239, formerly the heaviest known element, emitted its beta ray, it changed into a still heavier element, neptunium. Neptunium proved to be a rather unstable element, and emitted a beta ray in its turn. This change in the atom turned neptunium into another new element, plutonium. The names of these three elements are taken from the three farthest planets of our solar system.

Plutonium turned out to be a fairly stable element, about whose chemical properties enough was soon learned to prove that chemical separation of this new material from its parent uranium would be a relatively easy task. Plutonium does not readily follow the pattern by which it was formed, but makes the opposite transformation by which it gives off an alpha ray and becomes uranium 235. This, however, happens so slowly that there is plenty of time for the atom-splitting reaction of plutonium to do its work.

In the course of the researches it was also possible to make for the first time two heavier transuranium elements, numbers 95 named americium and 96 named curium, by bombardment with high-energy helium nuclei or alpha particles.

Production of materials for atomic bombs was at first planned to be located at the Clinton Engineer Works at Oak Ridge, Tenn. Later the plant for full scale manufacture of plutonium was built at Hanford, Wash., and the bomb laboratory was located at Los Alamos, N. M.

Science News Letter, June 22, 1946

MEDICINE

Vaccination Protects Against Tuberculosis

➤ B.C.G. VACCINATION against tuberculosis is protecting a large proportion of nurses and tuberculosis sanatorium employees in Saskatchewan, Can., from getting the disease from patients, Dr. R. G. Ferguson, director of medical services and general superintendent of the Saskatchewan Anti-Tuberculosis Association, reported at the meeting of the National Tuberculosis Association.

Tuberculosis cases among nurses were reduced to one-fourth and among employees to one-fifth the number that had occurred before the vaccination was instituted in 1938.

B.C.G. is made from living tuberculosis germs which have been greatly weakened in their disease producing capacity. It does not give 100% protection but has been found safe by the Canadian users and even when it did not prevent tuberculosis, it reduced its severity.

A serious situation which had been developing with regard to excessive tuberculosis among nurses and sanatorium employees no longer exists.

Science News Letter, June 22, 1946

ENGINEERING

Navy's Future Subs May Use Atomic Power

➤ ATOMIC POWERED navies of the future will make the submarine a major fleet unit of greater importance than ever before, Rear Adm. H. G. Bowen, chief of the U. S. Navy's office of research and inventions, predicted in outlining the Navy's plans for the development and use of atomic energy.

Even with the present state of atomic energy development, Admiral Bowen described the installation of atomic power for submarines as "a very attractive proposition."

"Since oxygen or oxygen-bearing fuel will no longer be required, we will be able to realize submerged speeds, and submerged radii of action, which will put the submarine in a distinct class by itself, and make it a major combatant unit," the Navy research chief declared.

"Its development into a much larger vessel, capable of successfully carrying out many missions, is clearly indicated," he said.

Terming the Navy the greatest single user of power, Admiral Bowen warned that unless the use of atomic energy is faced "in the grand manner, we will fall flat on our faces."

"The Navy has no time to lose in adopting atomic power for surface ships and particularly submarines," he added.

On Navy ships, he foresaw atomic piles replacing boilers to produce steam for driving turbines and reciprocating engines. Citing speculation that atomic piles may not be expected to weigh less than 100 tons, the Admiral pointed out that present weights of power units in Navy ships far exceed that amount.

Science News Letter, June 22, 1946

MEDICINE

Mobile X-Ray Machines Help Fight Tuberculosis

➤ X-RAY MACHINES are taking to the road to help wipe out tuberculosis. Mounted in buses or trailers, these units roll along the highways from one village or small town to another, where they help to find unsuspected cases of the white plague.

Each case discovered and brought under treatment means not only a chance for recovery for that patient but the breaking of one more link in the chain by which the disease spreads to new victims.

Surgeon General Parran of the U. S. Public Health Service has recently accepted a new mobile X-ray laboratory made by General Electric X-ray Corporation in Chicago.

In Buffalo, N. Y., members of the National Tuberculosis Association have viewed a similiar X-ray unit on wheels made by Westinghouse Electric Corporation.

Advantage of these mobile units is that they can go into rural areas too far from medical centers for the population to be X-rayed and too small to afford an X-ray unit of their own.

The unit the Public Health Service has purchased at a cost of $18,000 can X-ray as many as 60 persons per hour. In actual service in the country, it is expected to X-ray 100 persons daily. This means that one or two previously unsuspected cases of tuberculosis could be found each day.

Army and civilian experience with mass chest X-ray procedures in recent years has shown that 12 cases of tuberculosis are found in every 1,000 adults X-rayed. The annual death toll of the disease in the United States is 55,000. Half the victims are between 20 and 44 years of age.

Science News Letter, June 22, 1946

HORTICULTURE

Corn Severely Damaged By Japanese Beetles

➤ JAPANESE BEETLES often damage corn severely by eating the silk as fast as the ears are set. In this way fertilization of the kernels is partially prevented and grain production reduced, says B. F. Coon, entomologist of the Pennsylvania State College's corn and tobacco research laboratory at Lancaster.

The insects cause severe injury if they feed on a silk within about six hours after hand-pollination, Mr. Coon stated. Some corn hybrids seem less subject to this type of injury than others. Sweet corn as well as field corn may be damaged.

When Mr. Coon simulated the damage done by Japanese beetles by cutting the silks and a half-inch of husk from ears six hours after hand-pollination, the injury to the corn was typical of that caused by the insects. When the cutting was done seven hours after pollination, however, little damage resulted. Presumably the pollen tubes had grown down past the cutting point in seven hours.

Science News Letter, June 22, 1946

IN SCIEN

INVENTION

Conical Rotating Valve For Combustion Engines

➤ AN INTERESTING effort to get away from poppet valves on internal combustion engines is represented in two patents granted to Waldo G. Gernandt of Detroit, on a conical rotating valve that fits into the cylinder head.

The cone of the valve terminates in a stem by which it is suspended from the top of the cylinder head, and which serves as bearing and as means of rotation, through suitable gear connections.

A wide passage is cut through the cone from its base to one side. The upper opening receives the fuel-air mixture when it is turned opposite the intake port; when turned to the exhaust port it permits the scavenging stroke of the piston to clear out the combustion products. When the opening is turned to face the spark plug, the cavity within the cone serves as the ignition chamber.

Special features on which the patents are based are forced oil lubrication, with a suction pump to remove excess oil, and provision for cooling. The two patents, Nos. 2,401,630 and 2,401,631, are assigned to the Briggs Manufacturing Company.

Science News Letter, June 22, 1946

AGRICULTURE

Grain Sorghums Important Crop

➤ GRAIN SORGHUM promises to become one of the great agriculture crops of Texas, Oklahoma, Kansas, New Mexico, Colorado, Nebraska, Missouri and Iowa it was predicted at the Second Southwest Chemurgic Conference by Terris A. Manley of Phoenix, Ariz.

One of the reasons for increased acreage of grain sorghums is that due to mechanical handling, from soil preparation to harvesting, one man alone can produce 160 acres of this crop. A minimum amount of moisture is needed adapting it to the drier areas.

Whisky and beer malt can be made in part from grain sorghum, while a starch that replaces imported cassava root for tapioca manufacture comes from the waxy types.

Science News Letter, June 22, 1946

NCE FIELDS

GENERAL SCIENCE

Gigantic Research Center For Automotive Problems

➤ RESEARCH and engineering work on the mechanical problems of the automobile business will occupy the largest portion of gigantic new laboratories and experimental shops to be erected by the Ford Motor Company at Dearborn, Mich.

The announcement was made June 4, the 50th anniversary of the day that the original Henry Ford drove the first Ford car through downtown Detroit. The center is dedicated to him, and to his son, the late Edsel B. Ford.

Construction will start as soon as materials are available. When completed, it will probably be the largest development of its kind in industry. Eight buildings are to be erected at an estimated cost of $50,000,000. They will be grouped around an artificial lake on a 500-acre tract of land, and will include the most modern equipment for work in chemistry, physics, metallurgy and mechanics.

Science News Letter, June 22, 1946

SURGERY

The Lame Walk After Nerve-Cutting Operation

➤ A FORMER MAIL carrier who could not walk more than 300 feet can now walk unlimited distances and is back at work carrying mail.

An amusement park operator whose job required a great deal of walking but who could not walk a block without pain can now walk continuously for three hours without pain.

A veteran who had already lost his left leg was saved from having his other leg cut off above the knee.

A laborer can now walk four blocks instead of two and is able to do indoor work though for years he could not work at all.

These and 21 other patients who owe their ability to walk, saving of a leg and freedom from pain to a nerve cutting operation are reported by Drs. Geza de Takats, Edson Fairbrother Fowler and Paul Jordan, and Capt. Thomas C. Risley, of the University of Illinois College of Medicine and the Veterans Facility at Hines, Ill. (*Journal, American Medical Association*, June 8).

The patients were unable to walk, threatened by gangrene and amputation, and suffered unbearable pain in some cases because of hardening and narrowing of arteries in their legs. The "excellent" results obtained by cutting nerves which influence constriction and dilation of the affected blood vessels are due to the release of normal tone of the blood vessel walls which in turn insures an even blood flow.

Science News Letter, June 22, 1946

AERONAUTICS

Fan Type Propeller Reduces Aircraft Sound

➤ FAN TYPE propeller with a large number of blades and a low tip speed is the only method by which the sound level of an airplane can be reduced, Theodore Theodorsen and Arthur A. Regier of the National Advisory Committee for Aeronautics told the National Light Aircraft meeting of the Institute of the Aeronautical Sciences in Detroit.

They discussed the practical use of conclusions made as a result of experiments at Langley Field. The so-called Gutin formula, with which aviation experts are familiar, permits the convenient calculation of the sound level of any aircraft propeller. A simplification of the formula, achieved by graphs, gives the function for the sound level in the direction of maximum intensity.

Airplane control from the viewpoint of the pilot's needs was discussed at the meeting by Wolfgang Langewiesche of Kollsman Instrument Division, Square D Company. Controls, he said, are much more than merely a means of obtaining rotational motion about the three axes; they are in essence a means by which the pilot fixes definite flight conditions. For example, he explained, a pilot knows that he is proceeding at high angle of attack largely by being aware that he is holding back pressure against the stick.

He suggested that present airplanes are so difficult to handle, not because of the essential nature of airplane control, but because the essential nature of the controls is falsified by such effects as torque and change of trim with change of power.

It is suggested further, he said, that airplanes would be easier to fly if manufacturers set themselves new standards of stability and control, calculated more closely to fit the pilot's needs.

Science News Letter, June 22, 1946

ICHTHYOLOGY

Starfish Apparently Come In Seven-Year Cycles

➤ STARFISH, one of the worst enemies of oysters, apparently come and go in seven-year cycles, Martin D. Burkenroad of the Bingham Oceanographic Laboratory, Yale University, reports in *Science* (June 7).

Mr. Burkenroad's conclusion is based on a study of all available records of starfish numbers, going back to the middle of the last century. When they are most numerous, there may be more than half a ton of starfish to the acre, he says.

The last peak period for these oyster-destroyers ended with the season of 1943. Mr. Burkenroad expects the decline to continue until 1950, and the next maximum to come about 1957. Advantage may be taken of this knowledge, he believes, in planning oyster-planting and starfish-fighting activities.

A starfish attacks an oyster by wrapping its arms around the shell until the oyster begins to suffocate and has to open up. That's the end of the oyster.

Science News Letter, June 22, 1946

EDUCATION

Nuclear Energy To Be Studied at Oak Ridge

➤ AN INSTITUTE of nuclear studies, a sort of superuniversity of the atomic age, is being organized in connection with the atomic energy operations that are concentrated in Oak Ridge.

Sponsored by a group of southeastern universities, this new educational institution would carry out research at the Ph.D level and above in the fields of physics, chemistry, biology, medicine and engineering. It would provide formal channels for cooperative research between government, universities and the industrial agencies involved in the atomic energy project at Oak Ridge.

Plans for the establishment of the Oak Ridge Institute of Nuclear Studies are announced in the scientific journal, *Science* (June 14). W. G. Pollard of the University of Tennessee and P. W. McDaniel of the Manhattan Engineer District are named chairman and secretary respectively of the organizing executive committee. TVA, Duke University, Carbide & Carbon Chemicals Corporation, Tennessee Eastman Corporation, Vanderbilt University and Monsanto Chemical Company are also represented on the Committee.

Science News Letter, June 22, 1946

PHYSICS

Background of Atomic Bomb

It is well for the world to have the simple facts about the atomic bomb and something of its history in order to understand the Bikini demonstration.

By WATSON DAVIS

➤ WHILE THE attention of the world is focused on Bikini atoll in the Pacific awaiting the explosion of the fourth atomic bomb in history, here are the facts and background of the release of atomic energy and the bomb itself:

The atomic bomb, such as used at Bikini, is the most concentrated blast of energy that man has ever set loose.

It is not only the most powerful type of bomb in history, but its explosion is different from the conventional high explosives such as TNT. High explosives of the old sort have air, water and solid blast effects, but the atomic bomb has pressures of millions of atmospheres and adds to these radiation blast. It also produces clouds of radioactive substances more formidable than the most deadly poison gases.

Temperatures at the center of the atomic bomb explosion—which is all over in less than a millionth of a second—are so high, some 10,000,000,000 degrees Fahrenheit, that it is as though a star had been brought to earth. Nothing else in the world is quite so hot and so bright.

The energy of the atomic bomb comes from the actual conversion of matter into energy. The amount of energy released can be computed accurately by the famous law of equivalence of matter and energy that Dr. Albert Einstein, of relativity fame, developed in 1905. This formula is E equals m times c squared, where c is the velocity of light, and E stands for energy and m is mass.

Weight Military Secret

The actual weight of the active stuff in the atomic bomb is still a military secret. It is maybe about 60 pounds, which could be carried in a suitcase. If it were possible to convert 60 pounds of any kind of matter completely into energy, it would provide more energy than was generated by the whole electric power industry in the United States during the approximately four years of the war period, something like 680 billion kilowatt hours of energy.

Actually only a very small fraction of this total mass is changed into energy in the fission of the split atoms in the atomic bomb elements, whether it be uranium 235 or plutonium. The energy produced is still ample and terrifying. If all the atoms undergo fission in a 60-pound bomb, the energy released would be equal to that of the explosion of 550,000 tons of TNT. Yet if all the material in the active elements in the bomb could be gathered up and weighed after the explosion, you would still have almost 60 pounds.

Although immense energy is released from the atomic bomb, it is not as large as that involved in some of the natural occurrences on the face of the earth, such as great earthquakes. The earthquake in April off the coast of Alaska on the floor of the ocean that sent a tidal wave of destructive proportions to Hawaii undoubtedly involved much more energy. Destructive tidal waves from the underwater atomic bomb tests are not expected.

Power Localized

The great power of the atomic bomb explosion is relatively localized. The zone of total destruction is a circle of about two miles in diameter. People and structures a dozen miles away are relatively safe except for some possible effects and radioactive substances that might be blown upon them by winds in the wrong direction.

The Bikini tests are designed to make careful observations of many effects not accurately known, but because of the military nature of the tests much of the important and significant data will not be announced to the public.

Sealed Cans To Be Used

One of the most useful of the test instruments used in the Bikini tests is a sealed can such as is used to transport gasoline. The amount of collapse in this simple device gives an accurate measure of air pressure or air blast caused by the atomic bomb explosion.

The extraordinary radiation produced by the atomic bomb explosion is perhaps more remarkable than the great destruction caused. The heat produced is so intense that steel is vaporized and vanishes into the air.

In addition to burns, the victims of an atomic bomb suffer true radiation sickness similar to to that seen in patients who get sick following massive doses of X-rays and radium. Some severely radiated die in a short time. In others a fever is caused, the victim feels sick and has loss of appetite, gums bleed, teeth are loosened so that they could be removed with the fingers, gold fillings become radioactive and at least temporary baldness is suffered.

There was fear at first that the whole area exposed to the bomb would be made dangerously radioactive, but this does not seem to be the case. In the Japanese and New Mexico explosions, practically all the radioactive products of the explosions were carried upward in the ascending columns of hot air and dis-

Joint Army-Navy Task Force One Photograph

BIKINI REHEARSAL—But this is not an atomic bomb. It is a TNT underwater explosion performed as a preliminary test at the Naval Mine Warfare Test Station, Patuxent River, Md., to provide data for underwater atomic explosions at Bikini Atoll.

persed harmlessly over a wide area.

Extensive investigation will be made at Bikini of both radiation effects and radioactivity.

The details of the manufacture of the atomic bomb are secret, but the Smyth report gives a general idea of how it is put together. The bomb must be larger than a certain "critical size" in order to blow up. The number of neutrons produced by the first fissions of the atoms must be sufficient to get into other atoms and produce further fission. It must do this before the bomb flies apart. The time that elapses between the beginning and the end of this nuclear chain reaction is extraordinarily brief. This very, very short time—less than a millionth of a second—is the reason for most of the technical difficulties of making an atomic bomb.

Neutrons Reflected Back

The bomb is evidently surrounded by an envelope of pure graphite or a similar substance that reflects many neutrons back into the bomb instead of letting them escape outward where they would not hit the hearts of atoms in the bomb. This layer is called a tamper. In addition to being a neutron reflector, it also helps to delay the expansion of the reacting material.

Because there are enough neutrons from cosmic rays or sources inside the bomb to set up a chain reaction, it is necessary to keep the bomb in separate pieces, each below the critical size, until it is desired to produce the detonation. When the bomb is to be set off, these separate pieces must be brought together just as fast as possible. Evidently the method of assembling the bomb at the instant when an explosion is desired is to shoot one part as a projectile in a gun against a second part as a target. Doing this successfully is not as simple as it sounds, of course, and much of the "know-how" of the atomic bomb itself is concerned with this problem.

History of Atomic Bomb

When atomic bombs are exploded at Bikini, more historic dates will be added to the chronology of science's achievement of atomic power.

The story of the release of atomic energy really begins with many discoveries, experiments and theories in nuclear physics in the 1930's, but the immediate start of the researches which resulted so spectacularly was in January, 1939, when two Germans, O. Hahn (awarded the Nobel prize in 1945) and F. Strassmann proved that an isotope of barium was produced by neutron bombardment of uranium. The neutron is a fundamental particle of matter without electrical charge and with a mass about equal to that of the proton or nucleus of the hydrogen atom.

Two refugees from Germany, O. R. Frisch and Lise Meitner, suggested that the absorption of a neutron by a uranium nucleus sometimes caused that nucleus to split into approximately equal parts with the conversion of some of the mass, by Einstein's 1905 formulation, into enormous quantities of energy, a process called fission.

These reports were brought to the January 26, 1939, conference on theoretical physics at Washington, D. C., jointly sponsored by The George Washington University and the Carnegie Institution of Washington, with Niels Bohr of Denmark, Enrico Fermi and others discussing the problem. Experimental confirmation of uranium fission in several laboratories followed and the suggested likelihood of emission of neutrons in the process was demonstrated. This indicated the possibility of a chain reaction releasing energy explosively.

On December 2, 1942, the first self-maintaining nuclear chain reaction was initiated at an uranium-graphite pile at Stagg Field Stadium, Chicago. On July 16, 1945, 5:30 a.m., the first atomic explosion created by man blasted the New Mexico desert. On August 6, 1945, the first atomic bomb used in warfare was dropped on Hiroshima, Japan.

Science News Letter, June 22, 1946

GENERAL SCIENCE

Seeds and Insects To Be Tested in Atomic Blast

➤ IN ADDITION to testing warships, the atomic bomb blast at Bikini will be turned upon seeds, molds, insects, and diseases of plants and animals.

A collection of these test materials, carefully nursed by U. S. Department of Agriculture scientists, are now en route.

Plants with new hereditary strains may result from the atomic bomb explosions. X-rays are known to change the hereditary mechanisms of seeds and resulting plants, and scientists expect some such hereditary changes from the alpha and gamma radiation from the bomb.

Among the materials to be exposed at 25 locations in the bombed area are: cereals, forage crop seeds, vegetable seeds, flower seeds, cotton seed, smut spores, snap beans, micro-organisms, various cultures for treatment of animal diseases, beetles, weevils, moths, mosquito eggs, termites, bedbugs, several kinds of ticks and mites.

Science News Letter, June 22, 1946

Do You Know?

Baby birds are said to have a nervous mechanism in their throats which slows down the speed of swallowing progressively as they become more filled with food; this indicates to the mother bird which nestling needs feeding.

The *Altus project* in southwest Oklahoma is the first large scale irrigation undertaking in the state; construction, starting immediately, will put some 70,000 acres under irrigation when completed.

The first radar equipped *control tower* for civilian flying, recently installed by the Civil Aeronautics Administration at Indianapolis, uses a console screen to give the controller a "plan picture" of all planes within 30 miles.

One advantage of using *dynamite sticks* to blast out a farm ditch is that the soil removed may be evenly scattered by the blasting over an area 200 feet wide on each side of the opening.

Telegraph communication between Pittsburgh and the East was first established 100 years ago this year; railroad traffic from Pittsburgh to Philadelphia was opened four years later.

The short *electro-magnetic waves* used in radar pulses are harmless to guinea pigs, laboratory tests show, and undoubtedly are harmless to man.

Poultry manure has real value as a fertilizer for ornamental plants.

Australia is testing *grain sorghums* from Kansas and Nebraska.

ASTRONOMY

Amateurs Plan to See South American Eclipse

➤ TENTATIVE PLANS for an expedition to South America to see the total eclipse of the sun next May and suggestions on how to get a planetarium for your own town where you can study the planets and take that imaginary trip to the moon will be discussed in Bloomfield, Mich., week-end of the Fourth of July.

For the first time since the war, amateur astronomers, many of whom made important military instruments during the war and were not able to study the stars, are going to have a national convention. Some are sending photographs they have taken of stars and comets, others are shipping home-made telescopes for display at the Cranbrook Institute of Science, where the Fourth National Convention of Amateur Astronomers takes place, Friday through Sunday, July 5 to 7.

Thousands throughout the United States who are enthusiastic about the heavens or telescope-making, whether members of an amateur group or lone star-lovers, are invited to this convention in the suburbs of Detroit. Amateurs not only from this country but from Canada as well are accepting the invitation of the Detroit amateur astronomers.

Science News Letter, June 22, 1946

PHYSICS

Energy of Betatron Is Being Increased

➤ THE 100,000,000-volt betatron atom smasher in the General Electric Research Laboratory is having its output energy raised to 160,000,000 volts.

Devised by W. F. Westendorp of the Laboratory's X-ray section, the method for increasing the voltage is called "DC bias." Briefly, this consists of applying a direct current to the eletromagnet as well as an alternating current. This shifts the zero line from the middle of the current wave to its bottom and overcomes a difficulty caused by the fact that the magnetic field is in the wrong direction for guiding the electrons in their orbit while the voltage is passing from zero to its positive maximum, Mr. Westendorp explains.

Science News Letter, June 22, 1946

SURGERY

Spine Trouble May Cause Heart Disease Symptoms

➤ PAIN AROUND the heart, even when agonizing and of a constricting nature and radiating down the left arm, may be caused by trouble in the spine instead of the heart disease, angina pectoris, which it resembles, Col. Allen Izard Josey and Lt. Col. Francis Murphey, of O'Reilly General Hospital at Springfield, Mo., report (*Journal of the American Medical Association*, June 15).

The spinal trouble which they found causing the pain in 30 cases was a ruptured disk between vertebrae at the bottom of the neck.

The nerve pathway by which this condition produces pain around the heart is not known. Operation and sometimes treatment by neck traction relieved the condition.

The Army medical officers believe from their experience that ruptured disk should be suspected in all patients suspected of having either angina pectoris or coronary occlusion in whom the symptoms, physical signs and laboratory examinations are not conclusive.

Science News Letter, June 22, 1946

MEDICINE

Hayfever Cures Come, Go

Giving chemicals to weeds instead of patients might be best attack on the disease. Psychic factor needs consideration in judging value of new remedies.

➤ GIVING THE chemicals to the weeds rather than to people is probably the best way to get rid of hayfever. While the half-dozen or so new drugs for hayfever reported in the past six months may relieve symptoms, the weeds whose pollen causes the misery in sensitive persons can be eradicated by chemical spray or fog.

This is one of the peacetime benefits we can have from our biological warfare research which included potential chemical warfare on food crops as well as germ warfare on humans and domestic animals.

The new weed-killer 2,4-D, which was studied in these researches, can be a peaceful weapon to free millions of hayfever sufferers now and in the future. All that is necessary is to lay down a fog of this chemical on roadsides, empty lots and other areas infested with ragweed, the chief cause of hayfever. The fogging when done at a very early stage of flower development will kill the plants before they shed any pollen, Drs. Frederick G. Smith, Charles M. Hamner and Robert F. Carlson found in tests at the New York State Agricultural Experiment Station at Geneva, N. Y.

So far as chemicals to attack the disease in patients are concerned, medical authorities are likely to be skeptical about even the newest for which great claims are made, a substance called "Anthallan." Hayfever remedies come and go almost every year. Doctors undoubtedly will want to see results from carefully controlled studies before prescribing Anthallan to their patients.

The hayfever drug arousing most enthusiasm in the medical world at present is benadryl. Even this chemical has its limitations. It is not considered a cure, but a medicine that relieves symptoms in hayfever and hives. It is less effective in asthma.

Psychic factors play a very important part in hayfever, asthma, hives, and other allergic disorders. The repeated visits to the doctor or clinic and ensuing attention when a new drug is being tried for hayfever may play a large part in the beneficial results obtained at first. In carefully controlled studies, this factor is ruled out by substituting placebos, pills or capsules that look just like the drug under trial, for the drug itself for a time. If the patient continues to be helped, the improvement obviously is not due to the new drug. Whether such studies have been made with Anthallan is not known to authorities.

Since the psychic factor is important in allergic disorders, many patients may be helped by treatment for the underlying emotional or personality disturbance without the use of medicine or of desensitizing injections.

Science News Letter, June 22, 1946

ARCHAEOLOGY

Peruvian City Was Largest Ancient Center

➤ NEITHER the glory that was Greece nor the grandeur that was Rome produced the largest city in any ancient civilization, archaeologists of the Smithsonian Institution have decided.

The honor, they say, of being the largest ancient city probably should go to Chanchan, a Peruvian center centuries before the Inca Empire that the Spaniards overthrew.

Eleven square miles of ruins of this ancient city are located near the Viru Valley in Northern Peru where the most intensive archaeological studies yet conducted in South America are underway.

Center of the new research is the valley that was a site of flourishing culture long before the more famous Incas that the first European discoverers encountered. The Viru Valley is now about 20 miles long and three to four miles wide, and is believed to have had a larger habitable area at the time when it was a center of the ancient civilization.

How the valley grew smaller is one of the problems that is to be studied. The habitable portion of the valley has been subject to alkalization of the soil by alkali-loaded irrigation waters from the Andes, and much may be learned about long-range planning for irrigation projects by tracing the history of this ancient development.

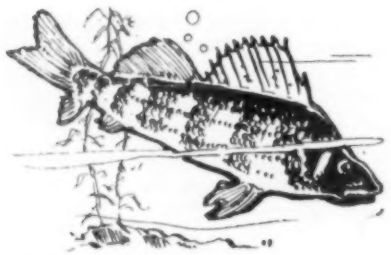
The work in the Viru Valley is being conducted under the auspices of the Institute of Andean Research, with seven cooperating institutions. They are the Bureau of American Ethnology and the Institute of Social Anthropology of the Smithsonian Institution, Columbia University, Yale University, the American Museum of Natural History, the Chicago Natural History Museum and the Institute de Estudios Etnologicos of Peru.

Science News Letter, June 22, 1946

PHYSIOLOGY

NATURE RAMBLINGS

by Frank Thone



Fish Can Drown

➤ RESPIRATION in fish is basically the same as it is in land animals, a matter of getting oxygen into contact with the blood corpuscles which will in turn get into contact with the body tissues that need it. If that does not take place, the animal dies, be it fish or be he man. Drowning is really a form of suffocation.

There are several ways in which fish can die for lack of oxygen. One is sheer mechanical interference with their normal mode of respiration, the ceaseless business of gulping water in through the mouth and expelling it through the gill-slits. If a fish has a stick thrust through mouth and gills and is then dragged at abnormal speed through the water (as small boys often do), it will die, and it will die of drowning, that is, suffocation, because it could not "breathe" naturally.

A more wholesale extermination of fish through de-oxygenation of water takes place sometimes in summer, when fish that have been landlocked in a pond or lagoon find the water getting too warm, and at the same time swarming with fast-multiplying small forms of animal and plant life. Fish ordinarily do not live in a green stagnant pool because green water is poisonous. It is because the myriads of lesser organisms living there snatch up every available molecule of oxygen for themselves, so that there is none left to pass through the gill walls and enrich the fishes' blood.

This kind of minor tragedy of the waters is relatively small-scale and unimportant, as compared with what the fish are often up against in rivers and lakes polluted by the outpourings of factories. Sometimes these polluents are chemicals that directly poison the fish; much more often, however, they are things that the swarming bacterial life of inland waters can use for food. They do feed greedily, using up oxygen in the process, until again the turbid water will not support fish respiration.

In considerable areas in the tropics, small lakes and sluggish rivers go nearly dry in the hot season, and have so little oxygen in their water at all times that ordinary fish cannot live in them. Their principal inhabitants are lung-fishes, strange creatures that have given up the use of gills entirely and depend on air sucked into their swimbladders which function as primitive lungs. When things get really bad, these fish sink to the bottom, ball themselves up into mud cocoons, and sleep the summer through as toads and turtles sleep through our winter.

Science News Letter, June 22, 1946

CHEMISTRY

Hens Need Lots of Lime To Package Eggs Properly

➤ HENS, like farmers, have trouble in packaging eggs. Farmers struggling with the problem of getting enough wooden or fiber cases in which to ship eggs should also consider the need of their laying hens for lime to form strong eggshells, the Utah Extension Service suggests. Approved poultry diets allow more than twice as much calcium for a laying mash as for a growing mash.

Science News Letter, June 22, 1946

CHEMISTRY

Valuable Chlorine from Sulfur and Common Salt

➤ CHLORINE, that poisonous green gas that is as necessary to many industries as gastric juice is to human physiology, can be made copiously and cheaply by a new process on which U. S. patent 2,401,644 has just been granted to a du Pont research chemist, Dr. Ralph K. Iler of East Cleveland, Ohio.

Raw materials are sulfur and common salt, which chemically is sodium chloride. The sulfur is burned, producing sulfur dioxide. To this more oxygen is added, forming sulfur trioxide. The trioxide is brought into contact with fine-grained salt, at a temperature between 450 and 600 degrees Centigrade. Part of the sulfur is seized upon by the sodium in the salt, forming sodium sulfate, which is removed.

From this reaction comes a mixed gas, containing chlorine and sulfur dioxide in equal quantities. This gas is then passed through dry silica gel, which adsorbs most of the sulfur dioxide. The rest is taken out by contacting the gas with activated carbon or other catalyst, which combines it with part of the chlorine to form sulfuryl chloride, and holds it in liquid form on the carbon.

The chlorine, now in substantially pure state, is drawn off and prepared for industrial use. The sulfuryl chloride, subsequently recovered, is broken down again to sulfur dioxide and chlorine by heating, and these gases are fed back into the process.

Science News Letter, June 22, 1946

A new family of *plastics* developed in Germany is based on isocyanates; no comparable product has been announced in the United States.

• Books of the Week •

THE ABC'S OF MODERN JAPAN—Wilson Morris—*American Council of Pacific Relations,* 64 p., illus., paper, 25 cents. A compendium of facts about Japan divided into three general sections, describing Japanese education, home life, and various social institutions; the story of the Japanese empire and its relations to the rest of the world; and an indication of Japan's trade relations and internal social and political trends.

BASKETFUL: The Story of Our Foods—Irmengarde Eberle—*Crowell,* 256 p., illus., $2. Where our many fruits and vegetables first grew on our earth and how man learned to develop them to the fine flavor, size and food value that they have today.

CURRICULUM ADJUSTMENTS FOR GIFTED CHILDREN—Elise H. Martens—Government Printing Office, 82 p., illus., paper, 20 cents. Practices and basic principles found in the organization of school programs to meet the needs of gifted and talented children, including reports of actual classroom experience.

ESQUISSE DE MES VOYAGES AU BRESIL ET PARAGUAY: Considérés Principalement sous le Rapport de la Botanique—Auguste de Saint-Hilaire—*Chronica Botanica,* 61 p., illus., paper, $2. Extensive travel account reprinted from Saint-Hilaire's HISTOIRE DES PLANTES LES PLUS REMARQUABLES DU BRESIL ET DU PARAGUAY. Though primarily of interest to botanists, it contains much of a general biological, geographical and historical interest. Biographical sketch by Anna E. Jenkins.

FLORA OF GUATEMALA: Part IV—Paul C. Standley and Julian A. Steyermark—*Chicago Natural History Museum,* 493 p., paper, $3.50. Fieldiana: Botany, Vol. 24, Part IV.

GERANIUMS: Pelargoniums for Windows and Gardens—Helen Van Pelt Wilson—*Barrows,* 248 p., illus., $2.75. A complete guide to geraniums, giving a new slant on an old fashioned plant.

THE IMPROVEMENT OF TEACHER EDUCATION: A Final Report by the Commission on Teacher Education—*American Council on Education,* 283 p., $2. A summary and interpretation of the experience gained from the five-year nationwide cooperative study of the Commission on Teacher Education. The Commission's conclusions and recommendations are included.

INDUSTRIAL ARTS ELECTRICITY—Clifford K. Lush and Glenn E. Engle—*Manual Arts Press,* 144 p., tables and illus., $2. A book written for use as a textbook in the junior high and high schools, but also of interest to the adult who wants to learn something of the mysteries of electricity.

LABORATORY MANUAL OF ANATOMY AND PHYSIOLOGY—Nellie D. Millard and Mary Jane C. Showers—*Saunders,* 119 p., diagrs., paper, $1. Thirty lessons, each of which can be completed in a two-hour period, including the study of living animals, dissection of fresh and preserved specimens, microscopic examination of living and prepared tissues and investigation of physiological phenomena.

LET'S SEE—E. Laurence Palmer—*New York State College of Agriculture,* 32 p., illus., paper, 10 cents. A leaflet explaining the nature of vision and giving some suggestions for the care of the eyes. Cornell Rural School Leaflet, Vol. 39, No. 3.

MAKE WORK EASIER—Helen Denniston and Margaret P. McCordic—*Extension Service, University of Wisconsin,* 24 p., illus., paper, 5 cents. Suggestions to the housewife for avoiding strain and saving energy by attention to posture and motions while at work.

OUR AMERICAN LAND—The Story of Its Abuse and Its Conservation—Hugh H. Bennett—*Government Printing Office,* illus., paper, 10 cents. Facts and figures about soil and water in the U.S., and their use and conservation.

OUR ATOMIC WORLD—Robert E. Marshak, Eldred C. Nelson, Leonard I. Schiff—*University of New Mexico Press,* 72 p., illus., paper, 50 cents. A factual primer devoted to atomic energy and the atomic bomb, attempting to provide the average reader with understanding of those features of atomic energy which will be of importance to him in the years to come. Written by three members of the Los Alamos Association of Scientists.

PHYSICAL CONSTANTS OF HYDROCARBONS: Vol. III, Mononuclear Aromatic Hydrocarbons—Gustav Egloff—*Reinhold,* 661 p., tables and diagrs., $15. American Chemical Society Monograph, No. 78.

PROBLEMS IN PREJUDICE—Eugene Hartley—*King's Crown Press,* 124 p., tables, paper, $2.25. Studies based on the data obtained by the administration of tests to college students; includes tolerance of college students, analysis of tolerance, tolerance and personality traits, etc.

ROCKETS—Robert H. Goddard—*American Rocket Society,* 119, p., tables and illus., $3.50. Dr. Goddard's two famous technical reports. A METHOD OF REACHING EXTREME ALTITUDES and LIQUID-PROPELLANT ROCKET DEVELOPMENT. There is also included an important foreword prepared by Dr. Goddard shortly before his death, a biography of the physicist, and many photographs.

THE SUBTLE SENSE—Ralph Bienfang—*Univ. of Oklahoma Press,* 157 p., diagrs., $2. A treatment of the sense of smell from every angle, from its physiology to its practical aspects in business, from the use of perfumes to the identification of poison gases.

VITAL PROBLEMS OF AIR COMMERCE—Lucien Zacharoff, ed.—*Duell, Sloan, and Pearce,* 338 p., $3. A collection of speeches made by specialists presenting the pros and cons of the controversial issues which are posed by the air age.

Science News Letter, June 22, 1946

•New Machines And Gadgets•

❁ *METALLIC TIRES for trucks are principally rubber but have a layer of fine metal wire of high tensile strength bonded by a special rubber cement between the two inner layers of rubber. They are built for use where rubber-tired vehicles operate under the most hazardous conditions.*

Science News Letter, June 22, 1946

❁ *DETECTION device measures both oxygen and hydrogen impurities in gases with the same instrument. Samples of the gases are dried and purified by activated charcoal and put in a calorimeter containing a precious-metal catalyst. Oxygen and hydrogen present combine, creating measurable heat.*

Science News Letter, June 22, 1946

❁ *AIR SAMPLER, used to determine the quantity of disease-spreading airborne bacteria within buildings, is portable and electrically operated. As air is driven slowly through the device, static electricity attracts the positive and negative germ-laden air particles onto surfaces coated with a nutrient sticky jelly.*

Science News Letter, June 22, 1946

❁ *ADHESIVE TAPE has its sticky coating in spaced bands, making its removal easier. It is perforated with spaced holes to permit ventilation, and has V-shaped notches on its edges so that it can be torn off in desired lengths.*

Science News Letter, June 22, 1946

❁ *SHOWER and window curtains of plastic film are waterproof and mildewproof, sheer enough to drape, and tough enough to withstand scrubbing with a brush. Rows of airy lace patterns, shown in the picture, are printed in white plastic ink on six different translucent pastel backgrounds.*

Science News Letter, June 22, 1946

❁ *MOTION PICTURE machine that can be used in a well-lighted room sends invisible ultraviolet rays from the projector to the screen. The screen is of a fluorescent material that absorbs ultraviolet radiation and emits visible light. The usual bright cone of light between projector and screen is eliminated.*

Science News Letter, June 22, 1946

❁ *CONDENSER microphone, no larger than a quarter, is a non-directional program pick-up device for use in broadcasting. Its small size, one inch long and one inch in diameter, helps eliminate distortion due to sound waves striking simultaneously against different portions of a microphone diaphragm.*

Science News Letter, June 22, 1946

❁ *LABORATORY pilot plant, a miniature production plant made of tantalum metal and Pyrex glass, can be used with most reagents except caustic alkalis and hydrofluoric acid. Designed for heat transfer determinations, it can be used as a complete reaction unit.*

Science News Letter, June 22, 1946

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 316.

Question Box

BIOCHEMISTRY

What is the latest advice on hayfever cures? p 397.

CHEMISTRY

Hens need what substance to package eggs properly? p. 398.

EDUCATION

What new institute is planned for Oak Ridge? p. 393.

GENERAL SCIENCE

Where will the new giant research center for automotive problems be built? p. 393.

MEDICINE

By what method is tuberculosis prevented in nurses? p. 391.

OPTICS

Living cells can be traced with what kind of new microscope? p. 390.

PHYSICS

How does the atomic bomb compare with other explosives? p. 394.

What are radioactive "tracers"? p. 387.

PHYSIOLOGY

What would cause fish to drown? p. 398.

PUBLIC HEALTH

What is the new idea for preventing international spread of disease? p. 389.

SURGERY

How have the lame been helped to walk? p. 393.

Where published sources are used they are cited.

The imprint to the right is mailing address for your Science News Letter.

Date on lower line is expiration of your subscription.

Renew early to avoid lapse in service.

In requesting change of address please give your old address as well as the new one, at least two weeks before change is to become effective.